CLAIMS

1. A method for converting carbon dioxide in flue gas into natural gas using dump energy, the method comprising:

1) ~~preforming~~ performing voltage transformation and rectification on dump energy that is generated from renewable energy generation and is difficult for storage or grid connection, introducing the dump energy into an electrolyte solution to electrolyze water therein to $H_2$ and $O_2$, and removing the water from $H_2$;

2) purifying industrial flue gas to separate $CO_2$ therein and purifying $CO_2$ trapped therefrom;

3) transporting $H_2$ generated from step 1) and $CO_2$ trapped from step 2) to a synthesis equipment comprising at least two fixed bed reactors, so that a high-temperature mixed gas with main ingredients of $CH_4$ and water vapor is generated through strong exothermic methanation reaction between $H_2$ and $CO_2$;

4) employing the high-temperature mixed gas generated from step 3) to conduct indirect heat exchange with process water to yield superheated water vapor;

5) delivering the superheated water vapor generated from step 4) to a turbine to generate electric energy, and returning the electric energy to step 1) for voltage transformation and rectification and water electrolysis; and

6) condensing and drying the mixed gas in step 4) cooled through heat exchange, until natural gas with $CH_4$ content up to the standard is obtained.

2. The method of claim 1, characterized in that the renewable energy is selected from solar energy, hydroenergy, wind energy, or a combination thereof.

3. The method of claim 1, characterized in that the electrolyte solution is potassium hydroxide solution with a density of 1.2-1.4 $kg/m^3$, and a reaction temperature of the electrolyte solution is controlled at 90 ± 2°C.